

# SEQUENCE LISTING

<110> Sorrentino, Brian  
 Bunting, Kevin  
 Schuetz, John  
 Nakauchi, Hiromitsu  
 <120> A Method of Identifying and/or Isolating Stem Cells  
 <130> 1340-1-021CIP2  
 <140> Unassigned  
 <141> 2001-05-23  
 <150> 09/584,586  
 <151> 2000-05-31  
 <150> PCT/US99/11825  
 <151> 1999-05-27  
 <150> 60/086,988  
 <151> 1998-05-28  
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| Ile        | Lys<br>290 | Lys        | Ala        | Ile        | Thr        | Ala<br>295 | Asn        | Ile        | Ser        | Ile        | Gly<br>300 | Ala        | Ala        | Phe        | Leu        |
| Leu<br>305 | Ile        | Tyr        | Ala        | Ser        | Tyr<br>310 | Ala        | Leu        | Ala        | Phe        | Trp<br>315 | Tyr        | Gly        | Thr        | Thr        | Leu<br>320 |
| Val        | Leu        | Ser        | Gly        | Glu<br>325 | Tyr        | Ser        | Ile        | Gly        | Gln<br>330 | Val        | Leu        | Thr        | Val        | Phe<br>335 | Phe        |
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| Gly        | Met<br>450 | Val        | Ser        | Val        | Asp        | Gly<br>455 | Gln        | Asp        | Ile        | Arg        | Thr<br>460 | Ile        | Asn        | Val        | Arg        |
| Phe<br>465 | Leu        | Arg        | Glu        | Ile        | Ile<br>470 | Gly        | Val        | Val        | Ser        | Gln<br>475 | Glu        | Pro        | Val        | Leu        | Phe<br>480 |
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| Met        | Asp        | Glu        | Ile<br>500 | Glu        | Lys        | Ala        | Val        | Lys<br>505 | Glu        | Ala        | Asn        | Ala        | Tyr<br>510 | Asp        | Phe        |
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| Arg        | Lys        | Gly        | Arg<br>580 | Thr        | Thr        | Ile        | Val        | Ile<br>585 | Ala        | His        | Arg        | Leu        | Ser<br>590 | Thr        | Val        |
| Arg        | Asn        | Ala        | Asp        | Val        | Ile        | Ala        | Gly        | Phe        | Asp        | Asp        | Gly        | Val        | Ile        | Val        | Glu        |

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| Lys 610 | Gly 610 | Asn     | His     | Asp     | Glu 615 | Leu 615 | Met     | Lys     | Glu     | Lys     | Gly 620 | Ile     | Tyr     | Phe     | Lys     |
| Leu 625 | Val     | Thr     | Met     | Gln     | Thr 630 | Ala     | Gly     | Asn     | Glu     | Val 635 | Glu     | Leu     | Glu     | Asn     | Ala 640 |
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| Asp     | Ser     | Arg     | Ser 660 | Ser     | Leu     | Ile     | Arg     | Lys 665 | Arg     | Ser     | Thr     | Arg     | Arg 670 | Ser     | Val     |
| Arg     | Gly     | Ser 675 | Gln     | Ala     | Gln     | Asp     | Arg 680 | Lys     | Leu     | Ser     | Thr     | Lys 685 | Glu     | Ala     | Leu     |
| Asp     | Glu 690 | Ser     | Ile     | Pro     | Pro     | Val 695 | Ser     | Phe     | Trp     | Arg     | Ile 700 | Met     | Lys     | Leu     | Asn     |
| Leu 705 | Thr     | Glu     | Trp     | Pro     | Tyr 710 | Phe     | Val     | Val     | Gly     | Val 715 | Phe     | Cys     | Ala     | Ile     | Ile 720 |
| Asn     | Gly     | Gly     | Leu     | Gln 725 | Pro     | Ala     | Phe     | Ala     | Ile 730 | Ile     | Phe     | Ser     | Lys     | Ile 735 | Ile     |
| Gly     | Val     | Phe     | Thr 740 | Arg     | Ile     | Asp     | Asp     | Pro 745 | Glu     | Thr     | Lys     | Arg     | Gln 750 | Asn     | Ser     |
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| Thr     | Phe 770 | Phe     | Leu     | Gln     | Gly     | Phe 775 | Thr     | Phe     | Gly     | Lys     | Ala 780 | Gly     | Glu     | Ile     | Leu     |
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| Leu     | Ala     | Val 835 | Ile     | Thr     | Gln     | Asn     | Ile 840 | Ala     | Asn     | Leu     | Gly     | Thr 845 | Gly     | Ile     | Ile     |
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| Val 865 | Pro     | Ile     | Ile     | Ala     | Ile 870 | Ala     | Gly     | Val     | Val     | Glu 875 | Met     | Lys     | Met     | Leu     | Ser 880 |
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| Thr     | Gln     | Ala     | Met     | Met     | Tyr     | Phe     | Ser     | Tyr     | Ala     | Gly     | Cys     | Phe     | Arg     | Phe     | Gly     |

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|-------------------------|---------------------|---------------------|-----------------|-----|--|-----|
| 945                     |                     | 950                 |                 | 955 |  | 960 |
| Ala Tyr Leu Val         | Ala His Lys Leu Met | Ser Phe Glu Asp Val | Leu Leu         |     |  |     |
|                         | 965                 | 970                 | 975             |     |  |     |
| Val Phe Ser Ala Val     | Val Phe Gly Ala Met | Ala Val Gly Gln Val | Ser             |     |  |     |
|                         | 980                 | 985                 | 990             |     |  |     |
| Ser Phe Ala Pro Asp Tyr | Ala Lys             | Ala Lys Ile Ser     | Ala Ala His Ile |     |  |     |
|                         | 995                 | 1000                | 1005            |     |  |     |
| Ile Met                 | Ile Ile Glu Lys Thr | Pro Leu Ile Asp     | Ser Tyr Ser Thr |     |  |     |
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| Glu Gly                 | Leu Met Pro Asn Thr | Leu Glu Gly Asn Val | Thr Phe Gly     |     |  |     |
| 1025                    | 1030                | 1035                |                 |     |  |     |
| Glu Val                 | Val Phe Asn Tyr Pro | Thr Arg Pro Asp Ile | Pro Val Leu     |     |  |     |
| 1040                    | 1045                | 1050                |                 |     |  |     |
| Gln Gly                 | Leu Ser Leu Glu Val | Lys Lys Gly Gln Thr | Leu Ala Leu     |     |  |     |
| 1055                    | 1060                | 1065                |                 |     |  |     |
| Val Gly                 | Ser Ser Gly Cys Gly | Lys Ser Thr Val Val | Gln Leu Leu     |     |  |     |
| 1070                    | 1075                | 1080                |                 |     |  |     |
| Glu Arg                 | Phe Tyr Asp Pro Leu | Ala Gly Lys Val Leu | Leu Asp Gly     |     |  |     |
| 1085                    | 1090                | 1095                |                 |     |  |     |
| Lys Glu                 | Ile Lys Arg Leu Asn | Val Gln Trp Leu Arg | Ala His Leu     |     |  |     |
| 1100                    | 1105                | 1110                |                 |     |  |     |
| Gly Ile                 | Val Ser Gln Glu Pro | Ile Leu Phe Asp Cys | Ser Ile Ala     |     |  |     |
| 1115                    | 1120                | 1125                |                 |     |  |     |
| Glu Asn                 | Ile Ala Tyr Gly Asp | Asn Ser Arg Val Val | Ser Gln Glu     |     |  |     |
| 1130                    | 1135                | 1140                |                 |     |  |     |
| Glu Ile                 | Val Arg Ala Ala Lys | Glu Ala Asn Ile His | Ala Phe Ile     |     |  |     |
| 1145                    | 1150                | 1155                |                 |     |  |     |
| Glu Ser                 | Leu Pro Asn Lys Tyr | Ser Thr Lys Val Gly | Asp Lys Gly     |     |  |     |
| 1160                    | 1165                | 1170                |                 |     |  |     |
| Thr Gln                 | Leu Ser Gly Gly Gln | Lys Gln Arg Ile Ala | Ile Ala Arg     |     |  |     |
| 1175                    | 1180                | 1185                |                 |     |  |     |
| Ala Leu                 | Val Arg Gln Pro His | Ile Leu Leu Leu Asp | Glu Ala Thr     |     |  |     |
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| Ser Ala                 | Leu Asp Thr Glu Ser | Glu Lys Val Val Gln | Glu Ala Leu     |     |  |     |
| 1205                    | 1210                | 1215                |                 |     |  |     |
| Asp Lys                 | Ala Arg Glu Gly Arg | Thr Cys Ile Val Ile | Ala His Arg     |     |  |     |
| 1220                    | 1225                | 1230                |                 |     |  |     |
| Leu Ser                 | Thr Ile Gln Asn Ala | Asp Leu Ile Val Val | Phe Gln Asn     |     |  |     |
| 1235                    | 1240                | 1245                |                 |     |  |     |
| Gly Arg                 | Val Lys Glu His Gly | Thr His Gln Gln Leu | Leu Ala Gln     |     |  |     |
| 1250                    | 1255                | 1260                |                 |     |  |     |
| Lys Gly                 | Ile Tyr Phe Ser Met | Val Ser Val Gln Ala | Gly Thr Lys     |     |  |     |
| 1265                    | 1270                | 1275                |                 |     |  |     |
| Arg Gln                 |                     |                     |                 |     |  |     |

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| cgctattcaa  | attggcttga | caagttgtat | atggtgggtg  | gaactttggc  | tgccatcatc  |       |              |       |   | 180  |
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| acagggttct  | tcatgaatct | ggaggaagac | atgaccagat  | atgcctatta  | ttacagtgga  |       |              |       |   | 360  |
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| gccaccacga  | tagctgaaaa | cattcgctat | ggccgtgaaa  | atgtcaccat  | ggatgagatt  |       |              |       |   | 1500 |
| gagaaagctg  | tcaaggaagc | caatgcctat | gactttatca  | tgaaactgcc  | tcataaattt  |       |              |       |   | 1560 |
| gacaccctgg  | ttggagagag | aggggcccag | ttgagtgggtg | ggcagaagca  | gaggatcgcc  |       |              |       |   | 1620 |
| attgcacgtg  | ccctggttcg | caaccccaag | atcctcctgc  | tggtatgaggc | cacgtcagcc  |       |              |       |   | 1680 |
| ttggacacag  | aaagcgaagc | agtggttcag | gtggctctgg  | ataaggccag  | aaaaggtcgg  |       |              |       |   | 1740 |
| accaccattg  | tgatagctca | tcgtttgtct | acagttcgta  | atgctgacgt  | catcgctggt  |       |              |       |   | 1800 |
| ttcgatgatg  | gagtcattgt | ggagaaagga | aatcatgatg  | aactcatgaa  | agagaaaggc  |       |              |       |   | 1860 |
| atttacttca  | aacttgtcac | aatgcagaca | gcaggaaatg  | aagttgaatt  | agaaaatgca  |       |              |       |   | 1920 |

|             |            |            |             |              |             |      |
|-------------|------------|------------|-------------|--------------|-------------|------|
| gctgatgaat  | ccaaaagtga | aattgatgcc | ttggaaatgt  | cttcaaataga  | ttcaagatcc  | 1980 |
| agtctaataa  | gaaaaagatc | aactcgtagg | agtgtccgtg  | gatcacaagc   | ccaagacaga  | 2040 |
| aagcttagta  | ccaaagaggc | tctggatgaa | agtatacctc  | cagtttcctt   | ttggaggatt  | 2100 |
| atgaagctaa  | atttaactga | atggccttat | tttggtgttg  | gtgtattttg   | tgccattata  | 2160 |
| aatggaggcc  | tgcaaccagc | atttgcaata | atattttcaa  | agattatagg   | ggttttttaca | 2220 |
| agaattgatg  | atcctgaaac | aaaacgacag | aatagtaact  | tgtttttcaact | attgttttcta | 2280 |
| gcccttgga   | ttattttctt | tattacattt | ttccttcaag  | gtttcacatt   | tggcaaagct  | 2340 |
| ggagagatcc  | tcaccaagcg | gctccgatac | atgggttttcc | gatccatgct   | cagacaggat  | 2400 |
| gtgagttggt  | ttgatgaccc | taaaaacacc | actggagcat  | tgactaccag   | gctcgccaat  | 2460 |
| gatgctgctc  | aagttaaagg | ggctataggt | tccaggcttg  | ctgtaattac   | ccagaatata  | 2520 |
| gcaaactcttg | ggacaggaat | aattatatcc | ttcatctatg  | gttggcaact   | aacactgtta  | 2580 |
| ctcttagcaa  | ttgtacccat | cattgcaata | gcaggagttg  | ttgaaatgaa   | aatgttgtct  | 2640 |
| ggacaagcac  | tgaaagataa | gaaagaacta | gaagggtgctg | ggaagatcgc   | tactgaagca  | 2700 |
| atagaaaact  | tccgaaccgt | tgtttctttg | actcaggagc  | agaagtttga   | acatatgtat  | 2760 |
| gctcagagtt  | tgcaaggtag | atacagaaac | tctttgagga  | aagcacacat   | ctttggaatt  | 2820 |
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| gcctacttgg  | tgccacataa | actcatgagc | tttgaggatg  | ttctgttagt   | attttcagct  | 2940 |
| gttgtctttg  | gtgccatggc | cgtggggcaa | gtcagttcat  | ttgtctctga   | ctatgccaaa  | 3000 |
| gccaaaatat  | cagcagccca | catcatcatg | atcattgaaa  | aaaccctttt   | gattgacagc  | 3060 |
| tacagcacgg  | aaggccta   | gccgaacaca | ttggaaggaa  | atgtcacatt   | tggtgaagtt  | 3120 |
| gtattcaact  | atcccaccg  | accggacatc | ccagtgcctc  | agggactgag   | cctggagggtg | 3180 |
| aagaagggcc  | agacgctggc | tctggtgggc | agcagtggct  | gtgggaagag   | cacagtggtc  | 3240 |
| cagctcctgg  | agcggttcta | cgacccttg  | gcagggaag   | tgctgcttga   | tggcaaagaa  | 3300 |
| ataaagcgac  | tgaatgttca | gtggctccga | gcacacctgg  | gcacgtgtgc   | ccaggagccc  | 3360 |
| atcctgtttg  | actgcagcat | tgctgagaac | attgcctatg  | gagacaacag   | ccgggtggtg  | 3420 |
| tcacaggaag  | agatcgtgag | ggcagcaaag | gaggccaaca  | tacatgcctt   | catcgagtca  | 3480 |
| ctgcctaata  | aatatagcac | taaagtagga | gacaaaggaa  | ctcagctctc   | tggtggccag  | 3540 |
| aaacaacgca  | ttgccatagc | tcgtgccctt | gttagacagc  | ctcatatttt   | gctttttggat | 3600 |
| gaagccacgt  | cagctctgga | tacagaaaag | gaaaagggtg  | tccaagaagc   | cctggacaaa  | 3660 |
| gccagagaag  | gccgcacctg | cattgtgatt | gtcaccgcc   | tgtccaccat   | ccagaatgca  | 3720 |
| gacttaatag  | tggtgtttca | gaatggcaga | gtcaaggagc  | atggcacgca   | tcagcagctg  | 3780 |
| ctggcacaga  | aaggcatcta | tttttcaatg | gtcagtgtcc  | aggctggaac   | aaagcgccag  | 3840 |
| tgaactctgg  | ttaactccac |            |             |              |             | 3860 |





|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Val | Leu | Ile | Gly | Ala | Phe | Ser | Val | Gly | Gln | Ala | Ser | Pro | Ser | Ile |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Glu | Ala | Phe | Ala | Asn | Ala | Arg | Gly | Ala | Ala | Tyr | Glu | Ile | Phe | Lys | Ile |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |
| Ile | Asp | Asn | Lys | Pro | Ser | Ile | Asp | Ser | Tyr | Ser | Lys | Ser | Gly | His | Lys |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |
| Pro | Asp | Asn | Ile | Lys | Gly | Asn | Leu | Glu | Phe | Arg | Asn | Val | His | Phe | Ser |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |
| Tyr | Pro | Ser | Arg | Lys | Glu | Val | Lys | Ile | Leu | Lys | Gly | Leu | Asn | Leu | Lys |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |
| Val | Gln | Ser | Gly | Gln | Thr | Val | Ala | Leu | Val | Gly | Asn | Ser | Gly | Cys | Gly |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |
| Lys | Ser | Thr | Thr | Val | Gln | Leu | Met | Gln | Arg | Leu | Tyr | Asp | Pro | Thr | Glu |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |
| Gly | Met | Val | Ser | Val | Asp | Gly | Gln | Asp | Ile | Arg | Thr | Ile | Asn | Val | Arg |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |
| Phe | Leu | Arg | Glu | Ile | Ile | Gly | Val | Val | Ser | Gln | Glu | Pro | Val | Leu | Phe |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |
| Ala | Thr | Thr | Ile | Ala | Glu | Asn | Ile | Arg | Tyr | Gly | Arg | Glu | Asn | Val | Thr |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Met | Asp | Glu | Ile | Glu | Lys | Ala | Val | Lys | Glu | Ala | Asn | Ala | Tyr | Asp | Phe |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |
| Ile | Met | Lys | Leu | Pro | His | Lys | Phe | Asp | Thr | Leu | Val | Gly | Glu | Arg | Gly |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |
| Ala | Gln | Leu | Ser | Gly | Gly | Gln | Lys | Gln | Arg | Ile | Ala | Ile | Ala | Arg | Ala |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |
| Leu | Val | Arg | Asn | Pro | Lys | Ile | Leu | Leu | Leu | Asp | Glu | Ala | Thr | Ser | Ala |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |
| Leu | Asp | Thr | Glu | Ser | Glu | Ala | Val | Val | Gln | Val | Ala | Leu | Asp | Lys | Ala |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |
| Arg | Lys | Gly | Arg | Thr | Thr | Ile | Val | Ile | Ala | His | Arg | Leu | Ser | Thr | Val |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |
| Arg | Asn | Ala | Asp | Val | Ile | Ala | Gly | Phe | Asp | Asp | Gly | Val | Ile | Val | Glu |
|     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |
| Lys | Gly | Asn | His | Asp | Glu | Leu | Met | Lys | Glu | Lys | Gly | Ile | Tyr | Phe | Lys |
|     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |
| Leu | Val | Thr | Met | Gln | Thr | Ala | Gly | Asn | Glu | Val | Glu | Leu | Glu | Asn | Ala |
| 625 |     |     |     | 630 |     |     |     |     |     | 635 |     |     |     |     | 640 |
| Ala | Asp | Glu | Ser | Lys | Ser | Glu | Ile | Asp | Ala | Leu | Glu | Met | Ser | Ser | Asn |
|     |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |
| Asp | Ser | Arg | Ser | Ser | Leu | Ile | Arg | Lys | Arg | Ser | Thr | Arg | Arg | Ser | Val |
|     |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |
| Arg | Gly | Ser | Gln | Ala | Gln | Asp | Arg | Lys | Leu | Ser | Thr | Lys | Glu | Ala | Leu |
|     |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Val | Leu | Ile | Gly | Ala | Phe | Ser | Val | Gly | Gln | Ala | Ser | Pro | Ser | Ile |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Glu | Ala | Phe | Ala | Asn | Ala | Arg | Gly | Ala | Ala | Tyr | Glu | Ile | Phe | Lys | Ile |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |
| Ile | Asp | Asn | Lys | Pro | Ser | Ile | Asp | Ser | Tyr | Ser | Lys | Ser | Gly | His | Lys |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |
| Pro | Asp | Asn | Ile | Lys | Gly | Asn | Leu | Glu | Phe | Arg | Asn | Val | His | Phe | Ser |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |
| Tyr | Pro | Ser | Arg | Lys | Glu | Val | Lys | Ile | Leu | Lys | Gly | Leu | Asn | Leu | Lys |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |
| Val | Gln | Ser | Gly | Gln | Thr | Val | Ala | Leu | Val | Gly | Asn | Ser | Gly | Cys | Gly |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |
| Lys | Ser | Thr | Thr | Val | Gln | Leu | Met | Gln | Arg | Leu | Tyr | Asp | Pro | Thr | Glu |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |
| Gly | Met | Val | Ser | Val | Asp | Gly | Gln | Asp | Ile | Arg | Thr | Ile | Asn | Val | Arg |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |
| Phe | Leu | Arg | Glu | Ile | Ile | Gly | Val | Val | Ser | Gln | Glu | Pro | Val | Leu | Phe |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |
| Ala | Thr | Thr | Ile | Ala | Glu | Asn | Ile | Arg | Tyr | Gly | Arg | Glu | Asn | Val | Thr |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Met | Asp | Glu | Ile | Glu | Lys | Ala | Val | Lys | Glu | Ala | Asn | Ala | Tyr | Asp | Phe |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |
| Ile | Met | Lys | Leu | Pro | His | Lys | Phe | Asp | Thr | Leu | Val | Gly | Glu | Arg | Gly |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |
| Ala | Gln | Leu | Ser | Gly | Gly | Gln | Lys | Gln | Arg | Ile | Ala | Ile | Ala | Arg | Ala |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |
| Leu | Val | Arg | Asn | Pro | Lys | Ile | Leu | Leu | Leu | Asp | Glu | Ala | Thr | Ser | Ala |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |
| Leu | Asp | Thr | Glu | Ser | Glu | Ala | Val | Val | Gln | Val | Ala | Leu | Asp | Lys | Ala |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |
| Arg | Lys | Gly | Arg | Thr | Thr | Ile | Val | Ile | Ala | His | Arg | Leu | Ser | Thr | Val |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |
| Arg | Asn | Ala | Asp | Val | Ile | Ala | Gly | Phe | Asp | Asp | Gly | Val | Ile | Val | Glu |
|     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |
| Lys | Gly | Asn | His | Asp | Glu | Leu | Met | Lys | Glu | Lys | Gly | Ile | Tyr | Phe | Lys |
|     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |
| Leu | Val | Thr | Met | Gln | Thr | Ala | Gly | Asn | Glu | Val | Glu | Leu | Glu | Asn | Ala |
| 625 |     |     |     | 630 |     |     |     |     |     | 635 |     |     |     |     | 640 |
| Ala | Asp | Glu | Ser | Lys | Ser | Glu | Ile | Asp | Ala | Leu | Glu | Met | Ser | Ser | Asn |
|     |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |
| Asp | Ser | Arg | Ser | Ser | Leu | Ile | Arg | Lys | Arg | Ser | Thr | Arg | Arg | Ser | Val |
|     |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |
| Arg | Gly | Ser | Gln | Ala | Gln | Asp | Arg | Lys | Leu | Ser | Thr | Lys | Glu | Ala | Leu |
|     |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |



|     |      |     |     |     |     |      |     |     |     |     |      |     |     |     |
|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| Ile | Met  | Ile | Ile | Glu | Lys | Thr  | Pro | Leu | Ile | Asp | Ser  | Tyr | Ser | Thr |
|     | 1010 |     |     |     |     | 1015 |     |     |     |     | 1020 |     |     |     |
| Glu | Gly  | Leu | Met | Pro | Asn | Thr  | Leu | Glu | Gly | Asn | Val  | Thr | Phe | Gly |
|     | 1025 |     |     |     |     | 1030 |     |     |     |     | 1035 |     |     |     |

|      |     |     |     |     |     |      |     |     |     |     |      |     |     |     |
|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| Glu  | Val | Val | Phe | Asn | Tyr | Pro  | Thr | Arg | Pro | Asp | Ile  | Pro | Val | Leu |
| 1040 |     |     |     |     |     | 1045 |     |     |     |     | 1050 |     |     |     |
| Gln  | Gly | Leu | Ser | Leu | Glu | Val  | Lys | Lys | Gly | Gln | Thr  | Leu | Ala | Leu |
| 1055 |     |     |     |     |     | 1060 |     |     |     |     | 1065 |     |     |     |
| Val  | Gly | Ser | Ser | Gly | Cys | Gly  | Lys | Ser | Thr | Val | Val  | Gln | Leu | Leu |
| 1070 |     |     |     |     |     | 1075 |     |     |     |     | 1080 |     |     |     |
| Glu  | Arg | Phe | Tyr | Asp | Pro | Leu  | Ala | Gly | Lys | Val | Leu  | Leu | Asp | Gly |
| 1085 |     |     |     |     |     | 1090 |     |     |     |     | 1095 |     |     |     |
| Lys  | Glu | Ile | Lys | Arg | Leu | Asn  | Val | Gln | Trp | Leu | Arg  | Ala | His | Leu |
| 1100 |     |     |     |     |     | 1105 |     |     |     |     | 1110 |     |     |     |
| Gly  | Ile | Val | Ser | Gln | Glu | Pro  | Ile | Leu | Phe | Asp | Cys  | Ser | Ile | Ala |
| 1115 |     |     |     |     |     | 1120 |     |     |     |     | 1125 |     |     |     |
| Glu  | Asn | Ile | Ala | Tyr | Gly | Asp  | Asn | Ser | Arg | Val | Val  | Ser | Gln | Glu |
| 1130 |     |     |     |     |     | 1135 |     |     |     |     | 1140 |     |     |     |
| Glu  | Ile | Val | Arg | Ala | Ala | Lys  | Glu | Ala | Asn | Ile | His  | Ala | Phe | Ile |
| 1145 |     |     |     |     |     | 1150 |     |     |     |     | 1155 |     |     |     |
| Glu  | Ser | Leu | Pro | Asn | Lys | Tyr  | Ser | Thr | Lys | Val | Gly  | Asp | Lys | Gly |
| 1160 |     |     |     |     |     | 1165 |     |     |     |     | 1170 |     |     |     |
| Thr  | Gln | Leu | Ser | Gly | Gly | Gln  | Lys | Gln | Arg | Ile | Ala  | Ile | Ala | Arg |
| 1175 |     |     |     |     |     | 1180 |     |     |     |     | 1185 |     |     |     |
| Ala  | Leu | Val | Arg | Gln | Pro | His  | Ile | Leu | Leu | Leu | Asp  | Glu | Ala | Thr |
| 1190 |     |     |     |     |     | 1195 |     |     |     |     | 1200 |     |     |     |
| Ser  | Ala | Leu | Asp | Thr | Glu | Ser  | Glu | Lys | Val | Val | Gln  | Glu | Ala | Leu |
| 1205 |     |     |     |     |     | 1210 |     |     |     |     | 1215 |     |     |     |
| Asp  | Lys | Ala | Arg | Glu | Gly | Arg  | Thr | Cys | Ile | Val | Ile  | Ala | His | Arg |
| 1220 |     |     |     |     |     | 1225 |     |     |     |     | 1230 |     |     |     |
| Leu  | Ser | Thr | Ile | Gln | Asn | Ala  | Asp | Leu | Ile | Val | Val  | Phe | Gln | Asn |
| 1235 |     |     |     |     |     | 1240 |     |     |     |     | 1245 |     |     |     |
| Gly  | Arg | Val | Lys | Glu | His | Gly  | Thr | His | Gln | Gln | Leu  | Leu | Ala | Gln |
| 1250 |     |     |     |     |     | 1255 |     |     |     |     | 1260 |     |     |     |
| Lys  | Gly | Ile | Tyr | Phe | Ser | Met  | Val | Ser | Val | Gln | Ala  | Gly | Thr | Lys |
| 1265 |     |     |     |     |     | 1270 |     |     |     |     | 1275 |     |     |     |
| Arg  | Gln |     |     |     |     |      |     |     |     |     |      |     |     |     |
| 1280 |     |     |     |     |     |      |     |     |     |     |      |     |     |     |

|            |    |            |      |            |     |            |              |            |   |                |
|------------|----|------------|------|------------|-----|------------|--------------|------------|---|----------------|
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| tatgcagatt |    | ggctggacaa |      | gctgtgcatg |     | attctgggaa |              | ctctcgctgc |   | tattatccat 180 |
| ggaacattac |    | ttcccctctt |      | gatgctggtg |     | tttggaacaa |              | tgacagatag |   | ttttacaaaa 240 |
| gcagaagcca |    | gtattctgcc |      | aagcattact |     | aatcaaagtg |              | gacccaacag |   | tactctgac 300  |
| atcagcaaca |    | gcagtctgga |      | ggaagagatg |     | gccatatacg |              | cctactatta |   | caccgggatt 360 |
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00666666 052901

|   |      |
|---|------|
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| tggttttgatg tgcattgatgt tggggagctc aacacccggc tcacagatga tgtctccaaa | 540  |
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| acttttagta ttggacactt ggccccaac atagaagcct ttgcaaacgc acgaggggca    | 1080 |
| gcctttgaaa tcttcaagat aattgataac gagccaagca ttgacagctt ctcaacaaag   | 1140 |
| ggctacaaac cagacagtat aatgggaaac ttagagttaa aaaatgttca cttcaactac   | 1200 |
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| aggctctacg accccttga gggcgtggc agtatcgacg gacaagacat cagaaccatc     | 1380 |
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| accacgatcg ccgagaacat tcgctatggc cgagaagatg tcaccatgga tgagattgag   | 1500 |
| aaagctgtca aggaagccaa tgcctatgac ttcatcatga aactgcccc ccaatttgac    | 1560 |
| accctggttg gtgagagagg ggcgcagctg agtgggggac agaaacagag aatcgccatt   | 1620 |
| gcccggggcc tgggtccgaa tcccaagatc cttttgttgg acgaggccac ctgagccctg   | 1680 |
| gatacagaaa gtgaagctgt ggtgcaggcc gcactggata aggctagaga aggcgggacc   | 1740 |
| accattgtga tagctcatcg cttgtctaca gttcgtaatg ctgacgtcat tgctggtttt   | 1800 |
| gatggtggtg tcattgtgga gcaaggaaat catgatgagc tcatgagaga aaagggcatt   | 1860 |
| tacttcaaac ttgtcatgac acagactaga ggaaatgaaa ttgaaccagg aaataatgct   | 1920 |
| tatggatccc agagtgacac tgatgcttct gaactgactt cagaagaatc caaatcacct   | 1980 |
| ttaataagga gatcaattta cagaagtgtc cacagaaagc aagaccaaga gagaagactt   | 2040 |
| agtatgaaag aggctgtgga tgaagatgtg cctctggttt ctttttggcg gatcctaaat   | 2100 |
| ctaaatctaa gtgaatggcc ttatttactt gttggcgtac tttgcgctgt tataaatggg   | 2160 |
| tgcatacaac cagtgtttgc catagtattt tcaaggattg taggggtttt ttcaagagat   | 2220 |
| gatgaccatg aaactaaacg acagaattgt aatttgtttt ccctgttctt tctggttatg   | 2280 |
| gggctgattt cttttgttac atatttcttt cagggttca catttggtgaa agccggagag   | 2340 |
| atcctcacca agcgagtccg atacatggtt ttcaaatacca tgctgagaca ggatataagc  | 2400 |

|             |             |             |            |             |             |      |
|-------------|-------------|-------------|------------|-------------|-------------|------|
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|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Lys        | Met        | Gly        | Lys<br>20  | Lys        | Ser        | Lys        | Lys        | Glu<br>25  | Lys        | Lys        | Glu        | Lys        | Lys<br>30  | Pro        | Ala        |
| Val        | Gly        | Val<br>35  | Phe        | Gly        | Met        | Phe        | Arg<br>40  | Tyr        | Ala        | Asp        | Trp        | Leu<br>45  | Asp        | Lys        | Leu        |
| Cys        | Met<br>50  | Ile        | Leu        | Gly        | Thr        | Leu<br>55  | Ala        | Ala        | Ile        | Ile        | His<br>60  | Gly        | Thr        | Leu        | Leu        |
| Pro<br>65  | Leu        | Leu        | Met        | Leu        | Val<br>70  | Phe        | Gly        | Asn        | Met        | Thr<br>75  | Asp        | Ser        | Phe        | Thr        | Lys<br>80  |
| Ala        | Glu        | Ala        | Ser        | Ile<br>85  | Leu        | Pro        | Ser        | Ile        | Thr<br>90  | Asn        | Gln        | Ser        | Gly        | Pro<br>95  | Asn        |
| Ser        | Thr        | Leu        | Ile<br>100 | Ile        | Ser        | Asn        | Ser        | Ser<br>105 | Leu        | Glu        | Glu        | Glu        | Met<br>110 | Ala        | Ile        |
| Tyr        | Ala        | Tyr<br>115 | Tyr        | Tyr        | Thr        | Gly        | Ile<br>120 | Gly        | Ala        | Gly        | Val        | Leu<br>125 | Ile        | Val        | Ala        |
| Tyr        | Ile<br>130 | Gln        | Val        | Ser        | Leu        | Trp<br>135 | Cys        | Leu        | Ala        | Ala        | Gly<br>140 | Arg        | Gln        | Ile        | His        |
| Lys<br>145 | Ile        | Arg        | Gln        | Lys        | Phe<br>150 | Phe        | His        | Ala        | Ile        | Met<br>155 | Asn        | Gln        | Glu        | Ile        | Gly<br>160 |
| Trp        | Phe        | Asp        | Val        | His<br>165 | Asp        | Val        | Gly        | Glu        | Leu<br>170 | Asn        | Thr        | Arg        | Leu        | Thr<br>175 | Asp        |
| Asp        | Val        | Ser        | Lys<br>180 | Ile        | Asn        | Asp        | Gly        | Ile<br>185 | Gly        | Asp        | Lys        | Ile        | Gly<br>190 | Met        | Phe        |
| Phe        | Gln        | Ser<br>195 | Ile        | Thr        | Thr        | Phe        | Leu<br>200 | Ala        | Gly        | Phe        | Ile        | Ile<br>205 | Gly        | Phe        | Ile        |
| Ser        | Gly<br>210 | Trp        | Lys        | Leu        | Thr        | Leu<br>215 | Val        | Ile        | Leu        | Ala        | Val<br>220 | Ser        | Pro        | Leu        | Ile        |
| Gly<br>225 | Leu        | Ser        | Ser        | Ala        | Leu<br>230 | Trp        | Ala        | Lys        | Val        | Leu<br>235 | Thr        | Ser        | Phe        | Thr        | Asn<br>240 |
| Lys        | Glu        | Leu        | Gln        | Ala<br>245 | Tyr        | Ala        | Lys        | Ala        | Gly<br>250 | Ala        | Val        | Ala        | Glu        | Glu<br>255 | Val        |
| Leu        | Ala        | Ala        | Ile<br>260 | Arg        | Thr        | Val        | Ile        | Ala<br>265 | Phe        | Gly        | Gly        | Gln        | Gln<br>270 | Lys        | Glu        |
| Leu        | Glu        | Arg<br>275 | Tyr        | Asn        | Lys        | Asn        | Leu<br>280 | Glu        | Glu        | Ala        | Lys        | Asn<br>285 | Val        | Gly        | Ile        |
| Lys        | Lys<br>290 | Ala        | Ile        | Thr        | Ala        | Ser<br>295 | Ile        | Ser        | Ile        | Gly        | Ile<br>300 | Ala        | Tyr        | Leu        | Leu        |
| Val<br>305 | Tyr        | Ala        | Ser        | Tyr        | Ala<br>310 | Leu        | Ala        | Phe        | Trp        | Tyr<br>315 | Gly        | Thr        | Ser        | Leu        | Val<br>320 |
| Leu        | Ser        | Asn        | Glu        | Tyr<br>325 | Ser        | Ile        | Gly        | Glu        | Val<br>330 | Leu        | Thr        | Val        | Phe        | Phe<br>335 | Ser        |
| Ile        | Leu        | Leu        | Gly<br>340 | Thr        | Phe        | Ser        | Ile        | Gly<br>345 | His        | Leu        | Ala        | Pro        | Asn<br>350 | Ile        | Glu        |
| Ala        | Phe        | Ala<br>355 | Asn        | Ala        | Arg        | Gly        | Ala<br>360 | Ala        | Phe        | Glu        | Ile        | Phe<br>365 | Lys        | Ile        | Ile        |

[illegible]

**THE UNIVERSITY OF CHICAGO**

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Asn | Glu | Pro | Ser | Ile | Asp | Ser | Phe | Ser | Thr | Lys | Gly | Tyr | Lys | Pro |
| 370 |     |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |
| Asp | Ser | Ile | Met | Gly | Asn | Leu | Glu | Phe | Lys | Asn | Val | His | Phe | Asn | Tyr |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |
| Pro | Ser | Arg | Ser | Glu | Val | Gln | Ile | Leu | Lys | Gly | Leu | Asn | Leu | Lys | Val |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |
| Lys | Ser | Gly | Gln | Thr | Val | Ala | Leu | Val | Gly | Asn | Ser | Gly | Cys | Gly | Lys |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |
| Ser | Thr | Thr | Val | Gln | Leu | Met | Gln | Arg | Leu | Tyr | Asp | Pro | Leu | Glu | Gly |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |
| Val | Val | Ser | Ile | Asp | Gly | Gln | Asp | Ile | Arg | Thr | Ile | Asn | Val | Arg | Tyr |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |
| Leu | Arg | Glu | Ile | Ile | Gly | Val | Val | Ser | Gln | Glu | Pro | Val | Leu | Phe | Ala |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |
| Thr | Thr | Ile | Ala | Glu | Asn | Ile | Arg | Tyr | Gly | Arg | Glu | Asp | Val | Thr | Met |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Asp | Glu | Ile | Glu | Lys | Ala | Val | Lys | Glu | Ala | Asn | Ala | Tyr | Asp | Phe | Ile |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |
| Met | Lys | Leu | Pro | His | Gln | Phe | Asp | Thr | Leu | Val | Gly | Glu | Arg | Gly | Ala |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |
| Gln | Leu | Ser | Gly | Gly | Gln | Lys | Gln | Arg | Ile | Ala | Ile | Ala | Arg | Ala | Leu |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |
| Val | Arg | Asn | Pro | Lys | Ile | Leu | Leu | Leu | Asp | Glu | Ala | Thr | Ser | Ala | Leu |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |
| Asp | Thr | Glu | Ser | Glu | Ala | Val | Val | Gln | Ala | Ala | Leu | Asp | Lys | Ala | Arg |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |
| Glu | Gly | Arg | Thr | Thr | Ile | Val | Ile | Ala | His | Arg | Leu | Ser | Thr | Val | Arg |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |
| Asn | Ala | Asp | Val | Ile | Ala | Gly | Phe | Asp | Gly | Gly | Val | Ile | Val | Glu | Gln |
|     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |
| Gly | Asn | His | Asp | Glu | Leu | Met | Arg | Glu | Lys | Gly | Ile | Tyr | Phe | Lys | Leu |
|     |     |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |
| Val | Met | Thr | Gln | Thr | Arg | Gly | Asn | Glu | Ile | Glu | Pro | Gly | Asn | Asn | Ala |
| 625 |     |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |
| Tyr | Gly | Ser | Gln | Ser | Asp | Thr | Asp | Ala | Ser | Glu | Leu | Thr | Ser | Glu | Glu |
|     |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |
| Ser | Lys | Ser | Pro | Leu | Ile | Arg | Arg | Ser | Ile | Tyr | Arg | Ser | Val | His | Arg |
|     |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |
| Lys | Gln | Asp | Gln | Glu | Arg | Arg | Leu | Ser | Met | Lys | Glu | Ala | Val | Asp | Glu |
|     |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |
| Asp | Val | Pro | Leu | Val | Ser | Phe | Trp | Arg | Ile | Leu | Asn | Leu | Asn | Leu | Ser |
|     |     | 690 |     |     |     | 695 |     |     |     |     | 700 |     |     |     |     |
| Glu | Trp | Pro | Tyr | Leu | Leu | Val | Gly | Val | Leu | Cys | Ala | Val | Ile | Asn | Gly |
| 705 |     |     |     |     | 710 |     |     |     |     | 715 |     |     |     |     | 720 |



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| Cys | Ile | Gln | Pro | Val | Phe | Ala | Ile | Val | Phe | Ser | Arg | Ile | Val | Gly | Val | 725  | 730  | 735  |
| Phe | Ser | Arg | Asp | Asp | Asp | His | Glu | Thr | Lys | Arg | Gln | Asn | Cys | Asn | Leu | 740  | 745  | 750  |
| Phe | Ser | Leu | Phe | Phe | Leu | Val | Met | Gly | Leu | Ile | Ser | Phe | Val | Thr | Tyr | 755  | 760  | 765  |
| Phe | Phe | Gln | Gly | Phe | Thr | Phe | Gly | Lys | Ala | Gly | Glu | Ile | Leu | Thr | Lys | 770  | 775  | 780  |
| Arg | Val | Arg | Tyr | Met | Val | Phe | Lys | Ser | Met | Leu | Arg | Gln | Asp | Ile | Ser | 785  | 790  | 795  |
| Trp | Phe | Asp | Asp | His | Lys | Asn | Ser | Thr | Gly | Ser | Leu | Thr | Thr | Arg | Leu | 805  | 810  | 815  |
| Ala | Ser | Asp | Ala | Ser | Ser | Val | Lys | Gly | Ala | Met | Gly | Ala | Arg | Leu | Ala | 820  | 825  | 830  |
| Val | Val | Thr | Gln | Asn | Val | Ala | Asn | Leu | Gly | Thr | Gly | Val | Ile | Leu | Ser | 835  | 840  | 845  |
| Leu | Val | Tyr | Gly | Trp | Gln | Leu | Thr | Leu | Leu | Leu | Val | Val | Ile | Ile | Pro | 850  | 855  | 860  |
| Leu | Ile | Val | Leu | Gly | Gly | Ile | Ile | Glu | Met | Lys | Leu | Leu | Ser | Gly | Gln | 865  | 870  | 875  |
| Ala | Leu | Lys | Asp | Lys | Lys | Gln | Leu | Glu | Ile | Ser | Gly | Lys | Ile | Ala | Thr | 885  | 890  | 895  |
| Glu | Ala | Ile | Glu | Asn | Phe | Arg | Thr | Ile | Val | Ser | Leu | Thr | Arg | Glu | Gln | 900  | 905  | 910  |
| Lys | Phe | Glu | Thr | Met | Tyr | Ala | Gln | Ser | Leu | Gln | Val | Pro | Tyr | Arg | Asn | 915  | 920  | 925  |
| Ala | Met | Lys | Lys | Ala | His | Val | Phe | Gly | Ile | Thr | Phe | Ser | Phe | Thr | Gln | 930  | 935  | 940  |
| Ala | Met | Met | Tyr | Phe | Ser | Tyr | Ala | Ala | Cys | Phe | Arg | Phe | Gly | Ala | Tyr | 945  | 950  | 955  |
| Leu | Val | Ala | Gln | Gln | Leu | Met | Thr | Phe | Glu | Asn | Val | Met | Leu | Val | Phe | 965  | 970  | 975  |
| Ser | Ala | Val | Val | Phe | Gly | Ala | Met | Ala | Ala | Gly | Asn | Thr | Ser | Ser | Phe | 980  | 985  | 990  |
| Ala | Pro | Asp | Tyr | Ala | Lys | Ala | Lys | Val | Ser | Ala | Ser | His | Ile | Ile | Arg | 995  | 1000 | 1005 |
| Ile | Ile | Glu | Lys | Thr | Pro | Glu | Ile | Asp | Ser | Tyr | Ser | Thr | Glu | Gly |     | 1010 | 1015 | 1020 |
| Leu | Lys | Pro | Thr | Leu | Leu | Glu | Gly | Asn | Val | Lys | Phe | Asn | Gly | Val |     | 1025 | 1030 | 1035 |
| Gln | Phe | Asn | Tyr | Pro | Thr | Arg | Pro | Asn | Ile | Pro | Val | Leu | Gln | Gly |     | 1040 | 1045 | 1050 |
| Leu | Ser | Leu | Glu | Val | Lys | Lys | Gly | Gln | Thr | Leu | Ala | Leu | Val | Gly |     | 1055 | 1060 | 1065 |

|      |     |     |     |     |     |      |     |     |     |     |      |     |     |     |
|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| Ser  | Ser | Gly | Cys | Gly | Lys | Ser  | Thr | Val | Val | Gln | Leu  | Leu | Glu | Arg |
| 1070 |     |     |     |     |     | 1075 |     |     |     |     | 1080 |     |     |     |
| Phe  | Tyr | Asp | Pro | Met | Ala | Gly  | Ser | Val | Phe | Leu | Asp  | Gly | Lys | Glu |
| 1085 |     |     |     |     |     | 1090 |     |     |     |     | 1095 |     |     |     |
| Ile  | Lys | Gln | Leu | Asn | Val | Gln  | Trp | Leu | Arg | Ala | His  | Leu | Gly | Ile |
| 1100 |     |     |     |     |     | 1105 |     |     |     |     | 1110 |     |     |     |
| Val  | Ser | Gln | Glu | Pro | Ile | Leu  | Phe | Asp | Cys | Ser | Ile  | Ala | Glu | Asn |
| 1115 |     |     |     |     |     | 1120 |     |     |     |     | 1125 |     |     |     |
| Ile  | Ala | Tyr | Gly | Asp | Asn | Ser  | Arg | Ala | Val | Ser | His  | Glu | Glu | Ile |
| 1130 |     |     |     |     |     | 1135 |     |     |     |     | 1140 |     |     |     |
| Val  | Arg | Ala | Ala | Lys | Glu | Ala  | Asn | Ile | His | Gln | Phe  | Ile | Asp | Ser |
| 1145 |     |     |     |     |     | 1150 |     |     |     |     | 1155 |     |     |     |
| Leu  | Pro | Asp | Lys | Tyr | Asn | Thr  | Arg | Val | Gly | Asp | Lys  | Gly | Thr | Gln |
| 1160 |     |     |     |     |     | 1165 |     |     |     |     | 1170 |     |     |     |
| Leu  | Ser | Gly | Gly | Gln | Lys | Gln  | Arg | Ile | Ala | Ile | Ala  | Arg | Ala | Leu |
| 1175 |     |     |     |     |     | 1180 |     |     |     |     | 1185 |     |     |     |
| Val  | Arg | Gln | Pro | His | Ile | Leu  | Leu | Leu | Asp | Glu | Ala  | Thr | Ser | Ala |
| 1190 |     |     |     |     |     | 1195 |     |     |     |     | 1200 |     |     |     |
| Leu  | Asp | Thr | Glu | Ser | Glu | Lys  | Val | Val | Gln | Glu | Ala  | Leu | Asp | Lys |
| 1205 |     |     |     |     |     | 1210 |     |     |     |     | 1215 |     |     |     |
| Ala  | Arg | Glu | Gly | Arg | Thr | Cys  | Ile | Val | Ile | Ala | His  | Arg | Leu | Ser |
| 1220 |     |     |     |     |     | 1225 |     |     |     |     | 1230 |     |     |     |
| Thr  | Ile | Gln | Asn | Ala | Asp | Leu  | Ile | Val | Val | Ile | Glu  | Asn | Gly | Lys |
| 1235 |     |     |     |     |     | 1240 |     |     |     |     | 1245 |     |     |     |
| Val  | Lys | Glu | His | Gly | Thr | His  | Gln | Gln | Leu | Leu | Ala  | Gln | Lys | Gly |
| 1250 |     |     |     |     |     | 1255 |     |     |     |     | 1260 |     |     |     |
| Ile  | Tyr | Phe | Ser | Met | Val | Gln  | Ala | Gly | Ala | Lys | Arg  | Ser |     |     |
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| Glu     | Tyr     | Ser     | Ile     | Gly 325 | Gln     | Val     | Leu     | Thr     | Val 330 | Phe     | Phe     | Ser     | Val     | Leu 335 | Ile     |
| Gly     | Ala     | Phe     | Ser 340 | Val     | Gly     | Gln     | Ala     | Ser 345 | Pro     | Asn     | Ile     | Glu     | Ala 350 | Phe     | Ala     |
| Asn     | Ala     | Arg 355 | Gly     | Ala     | Ala     | Tyr     | Glu 360 | Val     | Phe     | Lys     | Ile     | Ile 365 | Asp     | Asn     | Lys     |
| Pro     | Ser 370 | Ile     | Asp     | Ser     | Phe     | Ser 375 | Lys     | Ser     | Gly     | His     | Lys 380 | Pro     | Asp     | Asn     | Ile     |
| Gln 385 | Gly     | Asn     | Leu     | Glu     | Phe 390 | Lys     | Asn     | Ile     | His     | Phe 395 | Ser     | Tyr     | Pro     | Ser     | Arg 400 |
| Lys     | Glu     | Val     | Gln     | Ile 405 | Leu     | Lys     | Gly     | Leu     | Asn 410 | Leu     | Lys     | Val     | Lys     | Ser 415 | Gly     |
| Gln     | Thr     | Val     | Ala 420 | Leu     | Val     | Gly     | Asn     | Ser 425 | Gly     | Cys     | Gly     | Lys     | Ser 430 | Thr     | Thr     |
| Val     | Gln     | Leu 435 | Met     | Gln     | Arg     | Leu     | Tyr 440 | Asp     | Pro     | Leu     | Asp     | Gly 445 | Met     | Val     | Ser     |
| Ile     | Asp 450 | Gly     | Gln     | Asp     | Ile     | Arg 455 | Thr     | Ile     | Asn     | Val     | Arg 460 | Tyr     | Leu     | Arg     | Glu     |
| Ile 465 | Ile     | Gly     | Val     | Val     | Ser 470 | Gln     | Glu     | Pro     | Val     | Leu 475 | Phe     | Ala     | Thr     | Thr     | Ile 480 |
| Ala     | Glu     | Asn     | Ile     | Arg 485 | Tyr     | Gly     | Arg     | Glu     | Asp 490 | Val     | Thr     | Met     | Asp     | Glu 495 | Ile     |
| Glu     | Lys     | Ala     | Val 500 | Lys     | Glu     | Ala     | Asn     | Ala 505 | Tyr     | Asp     | Phe     | Ile     | Met 510 | Lys     | Leu     |
| Pro     | His     | Gln 515 | Phe     | Asp     | Thr     | Leu     | Val 520 | Gly     | Glu     | Arg     | Gly     | Ala 525 | His     | Val     | Ser     |
| Gly     | Gly 530 | Gln     | Lys     | Gln     | Arg     | Ile 535 | Ala     | Ile     | Ala     | Arg     | Ala 540 | Leu     | Val     | Arg     | Asn     |
| Pro 545 | Lys     | Ile     | Leu     | Leu     | Leu 550 | Asp     | Glu     | Ala     | Thr     | Ser 555 | Ala     | Leu     | Asp     | Thr     | Glu 560 |
| Ser     | Glu     | Ala     | Val     | Val 565 | Gln     | Ala     | Ala     | Leu     | Asp 570 | Lys     | Ala     | Arg     | Glu     | Gly 575 | Arg     |
| Thr     | Thr     | Ile     | Val 580 | Ile     | Ala     | His     | Arg     | Leu 585 | Ser     | Thr     | Val     | Arg     | Asn 590 | Ala     | Asp     |
| Val     | Ile     | Ala 595 | Gly     | Phe     | Asp     | Gly     | Gly 600 | Val     | Ile     | Val     | Glu     | Gln 605 | Gly     | Asn     | His     |
| Asp     | Glu 610 | Leu     | Met     | Arg     | Glu     | Lys 615 | Gly     | Ile     | Tyr     | Phe     | Lys 620 | Leu     | Val     | Met     | Thr     |
| Gln 625 | Thr     | Ala     | Gly     | Asn     | Glu 630 | Ile     | Glu     | Leu     | Gly     | Asn 635 | Glu     | Ala     | Cys     | Lys     | Ser 640 |
| Lys     | Asp     | Glu     | Ile     | Asp 645 | Asn     | Leu     | Asp     | Met     | Ser 650 | Ser     | Lys     | Asp     | Ser     | Gly 655 | Ser     |

**Table 1** *Summary of the data sets used in the study*

| Dataset       | Number of subjects | Number of trials | Number of conditions |
|---------------|--------------------|------------------|----------------------|
| Experiment 1  | 10                 | 100              | 10                   |
| Experiment 2  | 10                 | 100              | 10                   |
| Experiment 3  | 10                 | 100              | 10                   |
| Experiment 4  | 10                 | 100              | 10                   |
| Experiment 5  | 10                 | 100              | 10                   |
| Experiment 6  | 10                 | 100              | 10                   |
| Experiment 7  | 10                 | 100              | 10                   |
| Experiment 8  | 10                 | 100              | 10                   |
| Experiment 9  | 10                 | 100              | 10                   |
| Experiment 10 | 10                 | 100              | 10                   |



|      |     |     |     |     |     |      |     |     |     |     |      |     |     |     |
|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| Glu  | Lys | Thr | Pro | Glu | Ile | Asp  | Ser | Tyr | Ser | Thr | Gln  | Gly | Leu | Lys |
| 1010 |     |     |     |     |     | 1015 |     |     |     |     | 1020 |     |     |     |
| Pro  | Asn | Met | Leu | Glu | Gly | Asn  | Val | Gln | Phe | Ser | Gly  | Val | Val | Phe |
| 1025 |     |     |     |     |     | 1030 |     |     |     |     | 1035 |     |     |     |
| Asn  | Tyr | Pro | Thr | Arg | Pro | Ser  | Ile | Pro | Val | Leu | Gln  | Gly | Leu | Ser |
| 1040 |     |     |     |     |     | 1045 |     |     |     |     | 1050 |     |     |     |
| Leu  | Glu | Val | Lys | Lys | Gly | Gln  | Thr | Leu | Ala | Leu | Val  | Gly | Ser | Ser |
| 1055 |     |     |     |     |     | 1060 |     |     |     |     | 1065 |     |     |     |
| Gly  | Cys | Gly | Lys | Ser | Thr | Val  | Val | Gln | Leu | Leu | Glu  | Arg | Phe | Tyr |
| 1070 |     |     |     |     |     | 1075 |     |     |     |     | 1080 |     |     |     |
| Asp  | Pro | Met | Ala | Gly | Ser | Val  | Phe | Leu | Asp | Gly | Lys  | Glu | Ile | Lys |
| 1085 |     |     |     |     |     | 1090 |     |     |     |     | 1095 |     |     |     |
| Gln  | Leu | Asn | Val | Gln | Trp | Leu  | Arg | Ala | Gln | Leu | Gly  | Ile | Val | Ser |
| 1100 |     |     |     |     |     | 1105 |     |     |     |     | 1110 |     |     |     |
| Gln  | Glu | Pro | Ile | Leu | Phe | Asp  | Cys | Ser | Ile | Ala | Glu  | Asn | Ile | Ala |
| 1115 |     |     |     |     |     | 1120 |     |     |     |     | 1125 |     |     |     |
| Tyr  | Gly | Asp | Asn | Ser | Arg | Val  | Val | Ser | Tyr | Glu | Glu  | Ile | Val | Arg |
| 1130 |     |     |     |     |     | 1135 |     |     |     |     | 1140 |     |     |     |
| Ala  | Ala | Lys | Glu | Ala | Asn | Ile  | His | Gln | Phe | Ile | Asp  | Ser | Leu | Pro |
| 1145 |     |     |     |     |     | 1150 |     |     |     |     | 1155 |     |     |     |
| Asp  | Lys | Tyr | Asn | Thr | Arg | Val  | Gly | Asp | Lys | Gly | Thr  | Gln | Leu | Ser |
| 1160 |     |     |     |     |     | 1165 |     |     |     |     | 1170 |     |     |     |
| Gly  | Gly | Gln | Lys | Gln | Arg | Ile  | Ala | Ile | Ala | Arg | Ala  | Leu | Val | Arg |
| 1175 |     |     |     |     |     | 1180 |     |     |     |     | 1185 |     |     |     |
| Gln  | Pro | His | Ile | Leu | Leu | Leu  | Asp | Glu | Ala | Thr | Ser  | Ala | Leu | Asp |
| 1190 |     |     |     |     |     | 1195 |     |     |     |     | 1200 |     |     |     |
| Thr  | Glu | Ser | Glu | Lys | Val | Val  | Gln | Glu | Ala | Leu | Asp  | Lys | Ala | Arg |
| 1205 |     |     |     |     |     | 1210 |     |     |     |     | 1215 |     |     |     |
| Glu  | Gly | Arg | Thr | Cys | Ile | Val  | Ile | Ala | His | Arg | Leu  | Ser | Thr | Ile |
| 1220 |     |     |     |     |     | 1225 |     |     |     |     | 1230 |     |     |     |
| Gln  | Asn | Ala | Asp | Leu | Ile | Val  | Val | Ile | Gln | Asn | Gly  | Lys | Val | Lys |
| 1235 |     |     |     |     |     | 1240 |     |     |     |     | 1245 |     |     |     |
| Glu  | His | Gly | Thr | His | Gln | Gln  | Leu | Leu | Ala | Gln | Lys  | Gly | Ile | Tyr |
| 1250 |     |     |     |     |     | 1255 |     |     |     |     | 1260 |     |     |     |
| Phe  | Ser | Met | Val | Ser | Val | Gln  | Ala | Gly | Ala | Lys | Arg  | Ser |     |     |
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Pro Thr Gly Gly Gly Lys Ser Ser Leu Leu Asp Val Leu Ala Ala Arg  
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| Thr | Leu | Leu | Ala | Ser | Gly | Arg | Leu | Met | Phe | His | Gly | Pro | Ala | Gln | Glu |  |  |
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| Ala | Leu | Gly | Tyr | Phe | Glu | Ser | Ala | Gly | Tyr | His | Cys | Glu | Ala | Tyr | Asn |  |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |  |
| Asn | Pro | Ala | Asp | Phe | Phe | Leu | Asp | Ile | Ile | Asn | Gly | Asp | Ser | Thr | Ala |  |  |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |  |
| Val | Ala | Leu | Asn | Arg | Glu | Glu | Asp | Phe | Lys | Ala | Thr | Glu | Ile | Ile | Glu |  |  |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |  |
| Pro | Ser | Lys | Gln | Asp | Lys | Pro | Leu | Ile | Glu | Lys | Leu | Ala | Glu | Ile | Tyr |  |  |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |  |
| Val | Asn | Ser | Ser | Phe | Tyr | Lys | Glu | Thr | Lys | Ala | Glu | Leu | His | Gln | Leu |  |  |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |  |
| Ser | Gly | Gly | Glu | Lys | Lys | Lys | Lys | Ile | Thr | Val | Phe | Lys | Glu | Ile | Ser |  |  |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |  |
| Tyr | Thr | Thr | Ser | Phe | Cys | His | Gln | Leu | Arg | Trp | Val | Ser | Lys | Arg | Ser |  |  |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |  |
| Phe | Lys | Asn | Leu | Leu | Gly | Asn | Pro | Gln | Ala | Ser | Ile | Ala | Gln | Ile | Ile |  |  |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |  |
| Val | Thr | Val | Val | Leu | Gly | Leu | Val | Ile | Gly | Ala | Ile | Tyr | Phe | Gly | Leu |  |  |
|     |     |     | 405 |     |     |     |     |     | 410 |     |     |     |     | 415 |     |  |  |
| Lys | Asn | Asp | Ser | Thr | Gly | Ile | Gln | Asn | Arg | Ala | Gly | Val | Leu | Phe | Phe |  |  |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |  |
| Leu | Thr | Thr | Asn | Gln | Cys | Phe | Ser | Ser | Val | Ser | Ala | Val | Glu | Leu | Phe |  |  |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |  |
| Val | Val | Glu | Lys | Lys | Leu | Phe | Ile | His | Glu | Tyr | Ile | Ser | Gly | Tyr | Tyr |  |  |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |  |
| Arg | Val | Ser | Ser | Tyr | Phe | Leu | Gly | Lys | Leu | Leu | Ser | Asp | Leu | Leu | Pro |  |  |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |  |
| Met | Arg | Met | Leu | Pro | Ser | Ile | Ile | Phe | Thr | Cys | Ile | Val | Tyr | Phe | Met |  |  |
|     |     |     | 485 |     |     |     |     | 490 |     |     |     |     |     | 495 |     |  |  |
| Leu | Gly | Leu | Lys | Pro | Lys | Ala | Asp | Ala | Phe | Phe | Val | Met | Met | Phe | Thr |  |  |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |  |
| Leu | Met | Met | Val | Ala | Tyr | Ser | Ala | Ser | Ser | Met | Ala | Leu | Ala | Ile | Ala |  |  |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |  |
| Ala | Gly | Gln | Ser | Val | Val | Ser | Val | Ala | Thr | Leu | Leu | Met | Thr | Ile | Cys |  |  |
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| Phe | Val | Phe | Met | Met | Ile | Phe | Ser | Gly | Leu | Leu | Val | Asn | Leu | Thr | Thr |  |  |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |  |
| Ile | Ala | Ser | Trp | Leu | Ser | Trp | Leu | Gln | Tyr | Phe | Ser | Ile | Pro | Arg | Tyr |  |  |
|     |     |     | 565 |     |     |     |     |     | 570 |     |     |     |     | 575 |     |  |  |
| Gly | Phe | Thr | Ala | Leu | Gln | His | Asn | Glu | Phe | Leu | Gly | Gln | Asn | Phe | Cys |  |  |
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| Pro | Gly | Leu | Asn | Ala | Thr | Gly | Asn | Asn | Pro | Cys | Asn | Tyr | Ala | Thr | Cys |  |  |
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Gly Leu Trp Lys Asn His Val Ala Leu Ala Cys Met Ile Val Ile Phe  
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Glu Gly Ala Val Leu Ser Phe His Asn Ile Cys Tyr Arg Val Lys Leu  
35 40 45  
Lys Ser Gly Phe Leu Pro Cys Arg Lys Pro Val Glu Lys Glu Ile Leu  
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Ser Asn Ile Asn Gly Ile Met Lys Pro Gly Leu Asn Ala Ile Leu Gly  
65 70 75 80  
Pro Thr Gly Gly Gly Lys Ser Ser Leu Leu Asp Val Leu Ala Ala Arg  
85 90 95  
Lys Asp Pro Ser Gly Leu Ser Gly Asp Val Leu Ile Asn Gly Ala Pro  
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Arg Pro Ala Asn Phe Lys Cys Asn Ser Gly Tyr Val Val Gln Asp Asp  
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| Ser | Gly | Gly | Glu | Lys | Lys | Lys | Lys | Ile | Thr | Val | Phe | Lys | Glu | Ile | Ser |
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| Tyr | Thr | Thr | Ser | Phe | Cys | His | Gln | Leu | Arg | Trp | Val | Ser | Lys | Arg | Ser |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |
| Phe | Lys | Asn | Leu | Leu | Gly | Asn | Pro | Gln | Ala | Ser | Ile | Ala | Gln | Ile | Ile |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |
| Val | Thr | Val | Val | Leu | Gly | Leu | Val | Ile | Gly | Ala | Ile | Tyr | Phe | Gly | Leu |
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|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |
| Leu | Thr | Thr | Asn | Gln | Cys | Phe | Ser | Ser | Val | Ser | Ala | Val | Glu | Leu | Phe |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |
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| Arg | Val | Ser | Ser | Tyr | Phe | Leu | Gly | Lys | Leu | Leu | Ser | Asp | Leu | Leu | Pro |
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| Met | Arg | Met | Leu | Pro | Ser | Ile | Ile | Phe | Thr | Cys | Ile | Val | Tyr | Phe | Met |
|     |     |     | 485 |     |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Leu | Gly | Leu | Lys | Ala | Lys | Ala | Asp | Ala | Phe | Phe | Val | Met | Met | Phe | Thr |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |
| Leu | Met | Met | Val | Ala | Tyr | Ser | Ala | Ser | Ser | Met | Ala | Leu | Ala | Ile | Ala |
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| Pro | Gly | Leu | Asn | Ala | Thr | Gly | Asn | Asn | Pro | Cys | Asn | Tyr | Ala | Thr | Cys |
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